

CLAIMS

What is claimed is:

1 1. A method for measuring client-side performance, the method comprising the steps of:
2 intercepting an item that is to be sent to a client process prior to the arrival of the item
3 at the client process;
4 modifying the item to produce a modified item that includes code which causes one
5 or more processors on the client device to perform the steps of:
6 measuring performance related to a service associated with the item, and
7 performing one or more acts based on a measurement resulting from said step
8 of measuring performance; and
9 sending the modified item to the client process.

1 2. The method of Claim 1, wherein said step of modifying the item is
2 performed transparently relative to an application that generates the item for the
3 service.

1 3. The method of Claim 1, wherein said steps of measuring performance
2 and performing one or more acts based on the measurement are performed
3 transparently relative to a user of the client process.

1 4. The method of Claim 1, said step of performing one or more acts based
2 on the measurement further comprising the step of sending data indicating the
3 measurement to an entity over a network.

1 5. The method of Claim 4, said step of sending the data to an entity further
2 comprising storing the data in a data structure that is automatically sent to a
3 server device associated with said service in response to a later request from the
4 client process for said service.

1 6. The method of Claim 5, wherein:
2 the client process is a web browser; and
3 the data structure is a cookie stored on the client device by the web
4 browser.

1 7. The method of Claim 4, wherein:
2 the step of modifying the item includes adding code to the item that causes the client
3 process to issue a request; and
4 said step of sending data to an entity further comprises sending the request including
5 the data to a server device.

1 8. The method of Claim 7, wherein the request is for a particular file and in
2 response to the request for the particular file no change is made by the client
3 process to a page already rendered on a display of the client device.

1 9. The method of Claim 4, further comprising storing the data indicating
2 the measurement in a log file on a server device.

1 10. The method of Claim 4, further comprising storing the data indicating
2 the measurement in a database of the entity on the network.

1 11. The method of Claim 1, further comprising the steps of:
2 receiving over a network data indicating the measurement from the client process;
3 and
4 performing one or more acts based on the data indicating the measurement.

1 12. The method of Claim 11, said step of performing one or more acts based
2 on the data indicating the measurement further comprising:

3 determining whether the data indicates performance has fallen below a
4 threshold; and

5 if the data indicates performance has fallen below the threshold, then
6 sending a notification message.

1 13. The method of Claim 1, said step of performing one or more acts based
2 on the measurement further comprising:

3 determining whether the measurement indicates performance has fallen
4 below a threshold; and

5 if the measurement indicates performance has fallen below the
6 threshold, then sending a notification message.

1 14. The method of Claim 13, said step of sending a notification message
2 comprising sending the notification message to an administrator for a server
3 device associated with said service.

1 15. The method of Claim 13, said step of sending a notification message
2 comprising sending the notification message to a user of the client process.

1 16. The method of Claim 1, wherein the measurement is a client response
2 time between a first time when a user of the client process selects an item on a
3 first web page rendered on a display of the client device and a second time
4 when a second web page is fully rendered on the display of the client device.

1 17. The method of Claim 1, wherein:

2 the code further causes the one or more processors on the client device
3 to perform the step of collecting ancillary information relating to
4 one or more components of the client process that participate in
5 obtaining the service from the application; and
6 said step of performing one or more acts based on the measurement
7 includes correlating the measurement with the ancillary
8 information.

1 18. The method of Claim 1, after said step of intercepting the item and

2 before said step of modifying the item, further comprising the steps of:

3 determining a type associated with the item produced by the application;
4 and
5 determining whether to perform said step of modifying the item based
6 on the type of the item.

1 19. The method of Claim 1, after said step of intercepting the item and

2 before said step of modifying the item, further comprising the steps of:

3 determining a unique reference associated with the item produced by the
4 application; and
5 determining whether to perform said step of modifying the item based
6 on whether the unique reference matches a particular reference.

1 20. The method of Claim 1, after said step of intercepting the item and

2 before said step of modifying the item, further comprising the steps of:

3 determining a percentage of modified items relative to items to be sent
4 to the client process; and

5 determining whether to perform said step of modifying the item based
6 on whether the percentage is below a particular percentage.

1 21. The method of Claim 1, wherein:
2 the item to be sent to the client process is stored in a cache before the
3 item is sent to the client process;
4 said step of intercepting the item comprises accessing the item in the
5 cache; and
6 said step of sending the modified item to the client process comprises
7 replacing the item in the cache with the modified item.

1 22. The method of Claim 21, wherein the cache is on a server device
2 associated with said service.

1 23. The method of Claim 21, wherein the cache is on a proxy server for the
2 client process.

1 24. The method of Claim 1, wherein:
2 the item includes hypertext markup language (HTML) statements; and
3 the client process is a web browser.

1 25. The method of Claim 24, wherein:
2 the web browser is configured to run javascript; and
3 the code comprises javascript statements.

1 26. The method of Claim 1, wherein the code conforms to a scripting
2 language.

1 27. The method of Claim 1, wherein the code comprises a Java applet.

1 28. The method of Claim 1, wherein the code comprises an ActiveX
2 module.

1 29. The method of Claim 1, said step of modifying the item further
2 comprising appending the code to the end of the item.

1 30. The method of Claim 1, wherein:
2 the item includes markup language statements; and
3 said step of modifying the item further comprises inserting the code at a
4 particular statement of the markup language statements.

1 31. The method of Claim 1, wherein:
2 the code includes at least one of first code added to a first item and
3 second code added to a second item; and
4 said measuring performance comprises starting a time measurement
5 based on the first code and ending a time measurement based on
6 the second code.

1 32. The method of Claim 31, wherein:
2 the first code is executed in response to a user of the client process
3 clicking on a control included in the first item; and
4 the second code is executed in response to fully loading the second item.

1 33. The method of Claim 1, wherein the code includes first code executed
2 upon arrival of the first code at the client process and second code executed in
3 response to a data structure generated by the client process after arrival of the
4 first code.

1 34. The method of Claim 33, wherein the data structure describes an event
2 at the client device.

1 35. The method of Claim 34, wherein the event is a message received from
2 an operating system executing on the client device.

1 36. The method of Claim 34, wherein the event is a manipulation of a
2 control of the client device by a user.

1 37. The method of Claim 33, wherein the second code causes the one or
2 more processors to perform the step of measuring performance.

1 38. The method of Claim 33, wherein the second code causes the one or
2 more processors to record a current time.

1 39. The method of Claim 33, wherein:
2 the item to be sent to the client process includes third code to be
3 executed in response to the data structure generated by the client
4 process; and
5 the first code causes the one or more processors to perform the step of
6 replacing the third with the second code.

1 40. The method of Claim 1, wherein the code includes first code executed in
2 response to a data structure describing a first event generated by the client
3 process and second code executed in response to a data structure describing a
4 second event generated by the client process.

1 41. The method of Claim 40, wherein:
2 the item to be sent to the client process includes third code to be
3 executed in response to the data structure describing the second
4 event by the client process; and
5 the first code causes the one or more processors to perform the step of
6 replacing the third with the second code.

1 42. A computer-readable medium carrying one or more sequences of instructions for
2 measuring client-side performance, wherein execution of the one or more sequences of
3 instructions by one or more processors causes the one or more processors to perform the steps
4 of:

5 intercepting an item that is to be sent to a client process prior to the arrival of the item
6 at the client process;
7 modifying the item to produce a modified item that includes code which causes one
8 or more processors on the client device to perform the steps of:
9 measuring performance related to a service associated with the item, and
10 performing one or more acts based on a measurement resulting from said step
11 of measuring performance; and
12 sending the modified item to the client process.

1 43. The computer-readable medium of Claim 42, wherein said step of
2 modifying the item is performed transparently relative to an application that
3 generates the item for the service.

1 44. The computer-readable medium of Claim 42, wherein said steps of
2 measuring performance and performing one or more acts based on the
3 measurement are performed transparently relative to a user of the client process.

1 45. The computer-readable medium of Claim 42, said step of performing
2 one or more acts based on the measurement further comprising the step of
3 sending data indicating the measurement to an entity over a network.

1 46. The computer-readable medium of Claim 45, said step of sending the
2 data to an entity further comprising storing the data in a data structure that is
3 automatically sent to a server device associated with said service in response to
4 a later request from the client process for said service.

1 47. The computer-readable medium of Claim 46, wherein:
2 the client process is a web browser; and
3 the data structure is a cookie stored on the client device by the web
4 browser.

1 48. The computer-readable medium of Claim 45, wherein:
2 the step of modifying the item includes adding code to the item that causes the client
3 process to issue a request; and
4 said step of sending data to an entity further comprises sending the request including
5 the data to a server device.

1 49. The computer-readable medium of Claim 48, wherein the request is for a
2 particular file and in response to the request for the particular file no change is
3 made by the client process to a page already rendered on a display of the client
4 device.

1 50. The computer-readable medium of Claim 45, wherein execution of the
2 one or more sequences of instructions by the one or more processors further
3 causes the one or more processors to perform the step of storing the data
4 indicating the measurement in a log file on a server device.

1 51. The computer-readable medium of Claim 45, wherein execution of the
2 one or more sequences of instructions by the one or more processors further
3 causes the one or more processors to perform the step of storing the data
4 indicating the measurement in a database of the entity on the network.

1 52. The computer-readable medium of Claim 42, wherein execution of the
2 one or more sequences of instructions by the one or more processors further
3 causes the one or more processors to perform the steps of:
4 receiving over a network data indicating the measurement from the client process;
5 and
6 performing one or more acts based on the data indicating the measurement.

1 53. The computer-readable medium of Claim 52, said step of performing
2 one or more acts based on the data indicating the measurement further
3 comprising:
4 determining whether the data indicates performance has fallen below a
5 threshold; and
6 if the data indicates performance has fallen below the threshold, then
7 sending a notification message.

1 54. The computer-readable medium of Claim 42, said step of performing
2 one or more acts based on the measurement further comprising:
3 determining whether the measurement indicates performance has fallen
4 below a threshold; and
5 if the measurement indicates performance has fallen below the
6 threshold, then sending a notification message.

1 55. The computer-readable medium of Claim 54, said step of sending a
2 notification message comprising sending the notification message to an
3 administrator for a server device associated with said service.

1 56. The computer-readable medium of Claim 54, said step of sending a
2 notification message comprising sending the notification message to a user of
3 the client process.

1 57. The computer-readable medium of Claim 42, wherein the measurement
2 is a client response time between a first time when a user of the client process
3 selects an item on a first web page rendered on a display of the client device and
4 a second time when a second web page is fully rendered on the display of the
5 client device.

1 58. The computer-readable medium of Claim 42, wherein:
2 the code further causes the one or more processors on the client device
3 to perform the step of collecting ancillary information relating to
4 one or more components of the client process that participate in
5 obtaining the service from the application; and

6 said step of performing one or more acts based on the measurement
7 includes correlating the measurement with the ancillary
8 information.

1 59. The computer-readable medium of Claim 42, wherein execution of the
2 one or more sequences of instructions by the one or more processors further
3 causes the one or more processors, after said step of intercepting the item and
4 before said step of modifying the item, to perform the steps of:

5 determining a type associated with the item produced by the application;
6 and
7 determining whether to perform said step of modifying the item based
8 on the type of the item.

1 60. The computer-readable medium of Claim 42, wherein execution of the
2 one or more sequences of instructions by the one or more processors further
3 causes the one or more processors, after said step of intercepting the item and
4 before said step of modifying the item, to perform the steps of:

5 determining a unique reference associated with the item produced by the
6 application; and
7 determining whether to perform said step of modifying the item based
8 on whether the unique reference matches a particular reference.

1 61. The computer-readable medium of Claim 42, wherein execution of the
2 one or more sequences of instructions by the one or more processors further
3 causes the one or more processors, after said step of intercepting the item and
4 before said step of modifying the item, to perform the steps of:

5 determining a percentage of modified items relative to items to be sent
6 to the client process; and

7 determining whether to perform said step of modifying the item based
8 on whether the percentage is below a particular percentage.

1 62. The computer-readable medium of Claim 42, wherein:
2 the item to be sent to the client process is stored in a cache before the
3 item is sent to the client process;
4 said step of intercepting the item comprises accessing the item in the
5 cache; and
6 said step of sending the modified item to the client process comprises
7 replacing the item in the cache with the modified item.

1 63. The computer-readable medium of Claim 62, wherein the cache is on a
2 server device associated with said service.

1 64. The computer-readable medium of Claim 62, wherein the cache is on a
2 proxy server for the client process.

1 65. The computer-readable medium of Claim 42, wherein:
2 the item includes hypertext markup language (HTML) statements; and
3 the client process is a web browser.

1 66. The computer-readable medium of Claim 65, wherein:
2 the web browser is configured to run javascript; and
3 the code comprises javascript statements.

1 67. The computer-readable medium of Claim 42, wherein the code conforms
2 to a scripting language.

1 68. The computer-readable medium of Claim 42, wherein the code
2 comprises a Java applet.

1 69. The computer-readable medium of Claim 42, wherein the code
2 comprises an ActiveX module.

1 70. The computer-readable medium of Claim 42, said step of modifying the
2 item further comprising appending the code to the end of the item.

1 71. The computer-readable medium of Claim 42, wherein:
2 the item includes markup language statements; and
3 said step of modifying the item further comprises inserting the code at a
4 particular statement of the markup language statements.

1 72. The computer-readable medium of Claim 42, wherein:
2 the code includes at least one of first code added to a first item and
3 second code added to a second item; and
4 said measuring performance comprises starting a time measurement
5 based on the first code and ending a time measurement based on
6 the second code.

1 73. The computer-readable medium of Claim 72, wherein:
2 the first code is executed in response to a user of the client process
3 clicking on a control included in the first item; and
4 the second code is executed in response to fully loading the second item.

1 74. The computer-readable medium of Claim 42, wherein the code includes
2 first code executed upon arrival of the first code at the client process and second
3 code executed in response to a data structure generated by the client process
4 after arrival of the first code.

1 75. The computer-readable medium of Claim 74, wherein the data structure
2 describes an event at the client device.

1 76. The computer-readable medium of Claim 75, wherein the event is a
2 message received from an operating system executing on the client device.

1 77. The computer-readable medium of Claim 75, wherein the event is a
2 manipulation of a control of the client device by a user.

1 78. The computer-readable medium of Claim 74, wherein the second code
2 causes the one or more processors to perform the step of measuring
3 performance.

1 79. The computer-readable medium of Claim 74, wherein the second code
2 causes the one or more processors to record a current time.

1 80. The computer-readable medium of Claim 74, wherein:
2 the item to be sent to the client process includes third code to be
3 executed in response to the data structure generated by the client
4 process; and
5 the first code causes the one or more processors to perform the step of
6 replacing the third with the second code.

1 81. The computer-readable medium of Claim 42, wherein the code includes
2 first code executed in response to a data structure describing a first event
3 generated by the client process and second code executed in response to a data
4 structure describing a second event generated by the client process.

1 82. The computer-readable medium of Claim 81, wherein:
2 the item to be sent to the client process includes third code to be
3 executed in response to the data structure describing the second
4 event by the client process; and
5 the first code causes the one or more processors to perform the step of
6 replacing the third with the second code.

1 83. A method for responding to client-side performance on a network connecting a client
2 device executing a client process to a server device configured to execute an application to
3 provide a service, the method comprising the steps of:
4 intercepting an item produced by the application;
5 modifying the item transparently relative to the application to produce a modified
6 item including code which causes one or more processors on the client device
7 to perform the steps of,
8 measuring performance related to the service provided by the application, and
9 based on a measurement resulting from said step of measuring performance,
10 sending data indicating the measurement to the server device;
11 sending the modified item to the client process;
12 receiving the data indicating the measurement;
13 storing the data indicating the measurement in a database; and
14 based on the data indicating the measurement,
15 determining whether the data indicates performance has fallen
16 below a threshold, and
17 if the data indicates performance has fallen below the threshold, then sending
18 a notification message.

1 84. A computer-readable medium carrying:
2 data indicating elements for presentation on a display of a device having one or more
3 processors by a client process executing on the one or more processors;
4 a first sequence of instructions executed upon receipt at the device; and
5 a second sequence of instructions invoked after arrival of the first sequence of
6 instructions by the client process,
7 wherein,
8 the second sequence of instructions causes the one or more processors to
9 perform the steps of:
10 measuring performance related to presenting the elements on the
11 display; and
12 performing one or more acts based on a measurement resulting from
13 said step of measuring performance; and
14 the first sequence of instructions causes the client process to associate the
15 second sequence of instructions with an element indicated by the data.